

What is Claimed is:

[c1] A method of evaluating the effect of defects on components in a semiconductor manufacturing process, said method comprising the steps of:
inspecting a component for defects using an inspection tool;
recording defect inspection data from the inspection tool;
accessing design data from a design data repository corresponding to the component being inspected;
modifying said design data for the component according to said defect inspection data; and
analyzing said modified design data by applying a rule set to determine a final disposition of the component according to previously established criteria.

[c2] The method of claim 1, wherein the components being inspected comprise masks for semiconductor wafers and the components are combined to generate a mask layer.

[c3] The method of claim 1, wherein the inspection tool is an optical inspection device and said defect inspection data include defect location, defect size and a designation of defect type as clear or opaque.

[c4] The method of claim 2, wherein said final disposition of the mask being inspected includes one of: scrapping the mask, repairing the mask, and accepting the mask.

[c5] The method of claim 2, wherein said previously established criteria include a determination as to whether a defect would be likely to cause product failure.

[c6] The method of claim 3, wherein said designation of defect type as clear or opaque is performed by one of manually by an operator and a defect classification tool.

[c7] The method of claim 3, wherein said defect inspection data comprise intensity contour plots, and the method for modifying said design data includes the following steps:
creating a simulated wafer image of the defect; and

merging said simulated wafer image into a simulated wafer image of a semiconductor chip.

[c8] The method of claim 1, wherein said design data repository comprises a database suitable for storage of large data files, and wherein said database includes design data for each component being inspected.

[c9] The method of claim 2, wherein the method for modifying said design data comprises the step of generating a representative defect shape for each mask layer being inspected corresponding to defects from said defect inspection data.

[c10] The method of claim 2, wherein said rule set includes criteria for analyzing both intra-level and inter-level problems of the mask layer corresponding to said inspection defect data.

[c11] A method of evaluating the effect of defects on masks for semiconductor wafers, said method comprising the steps of:
inspecting a mask for defects using an inspection tool;
recording defect inspection data from the inspection tool;
accessing design data from a design data repository corresponding to a level of a mask layer being inspected;
modifying said design data for said level of a mask layer according to said defect inspection data; and
analyzing said modified design data by applying a rule set to determine a final disposition of the mask according to previously established criteria.

[c12] The method of claim 11, wherein said final disposition of the mask includes one of: scrapping the mask, repairing the mask, and accepting the mask, and said previously established criteria includes a determination as to whether a defect would be likely to cause product failure.

[c13] The method of claim 12, said method further comprising the steps of:
repairing masks in which defects identified from the inspection tool are within acceptable limits; and
scrapping masks in which defects identified from the inspection tool are outside acceptable limits.

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[c14] The method of claim 11, further comprising the step of determining if a defect identified from the inspection tool will be resolved on a wafer by the photolithographic process.

[c15] The method of claim 14, wherein said method for determining if said defect will be resolved on the wafer is one of a set of heuristic rules and a commercially available tool or software program.

[c16] A system for evaluating the effect of defects in masks for semiconductor wafers during pre-shipment inspection and pre-acceptance inspection of masks for semiconductor wafers, said system comprising:
an inspection tool for inspecting a mask for defects;
a recording medium for storing said defect inspection data from the inspection tool;
a design data repository containing design level data for a level of a mask layer being inspected;
a computer program for modifying said design data for said level of mask layer according to said defect inspection data; and
a rule set for analyzing said modified design data to determine a final disposition of the mask according to previously established criteria.

[c17] The system of claim 16, wherein said final disposition of the mask includes one of: scrapping the mask, repairing the mask, and accepting the mask, and said previously established criteria includes a determination as to whether a defect would be likely to cause product failure.

[c18] The system according to claim 17, wherein the inspection tool is an optical inspection device and defect inspection data include defect location, defect size and a designation of defect type as clear or opaque.

[c19] A computer readable medium comprising code for causing a computer to implement steps of a method for evaluating the effect of defects on masks in a semiconductor manufacturing process, said method comprising:
inspecting a mask for defects using an inspection tool;
recording defect inspection data from the inspection tool;

accessing design data from a design data repository corresponding to a level of a mask layer being inspected;

modifying said design data for said level of a mask layer according to said defect inspection data; and

analyzing said modified design data by applying a rule set data to determine a final disposition of the mask according to previously established criteria.

[c20] The method of claim 19, wherein said final disposition of the mask includes one of: scrapping the mask, repairing the mask, and accepting the mask, and said previously established criteria includes a determination as to whether a defect would be likely to cause product failure.

[c21] A method for evaluating the effect of defects on components in a semiconductor manufacturing process, said method comprising the steps of:

- identifying critical portions of a component;
- inspecting the component for defects;
- analyzing locations of the defects to classify said defects into critical defects and non-critical defects; and
- determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects.

[c22] The method of claim 21, wherein the defects located within the critical portions are classified as the critical defects, and the defects located outside of the critical portions are classified as the non-critical defects.

[c23] The method of claim 22, wherein the acceptance rules comprises a standard acceptance rule applied to said critical defect and a loose acceptance rule applied to said non-critical defects.

[c24] The method of claim 23, wherein said final disposition of the component is selected from accepting, repairing or scrapping the component.

[c25] The method of claim 24, wherein the component is a mask used for a semiconductor manufacturing process.

[c26] The system for evaluating the effect of defects in components in a semiconductor manufacturing process, said system comprising:
an inspection tool for locating defects in a component; and
a computer system for classifying said defects into critical defects and non-critical defects based on locations of said defects and critical portions of said component,
wherein the computer systems determines a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects.

[c27] The system of claim 26, wherein said computer system classifies the defects located within said critical portions as the critical defects and the defects located outside of said critical portions as the non-critical defects.

[c28] The system of claim 27, the acceptance rules comprising a standard acceptance rule and a loose acceptance rule,
wherein the computer system applies the standard acceptance rule to said critical defects and the loose acceptance rule to said non-critical defects.

[c29] The system of claim 28, wherein the said final disposition of the component is selected from accepting, repairing or scrapping the component.

[c30] The method of claim 29, wherein the component is a mask used for a semiconductor manufacturing process.

[c31] A computer readable medium comprising codes for causing a computer to implement steps of a method for evaluating the effect of defects in components, the method comprising the steps of:
identifying critical portions of a component;
inspecting the component for defects;
analyzing locations of the defects to classify said defects into critical defects and non-critical defects; and
determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects.

[c32] The method of claim 31, wherein the defects located within the critical portions

are classified as the critical defects, and the defects located outside of the critical portions are classified as the non-critical defects.

[c33] The method of claim 32, the acceptance rules comprising a standard acceptance rule and a loose acceptance rule,

wherein the standard acceptance rule is applied to said critical defects and the loose acceptance rule is applied to said non-critical defects.

[c34] The method of claim 33, wherein said final disposition of the component is selected from accepting, repairing or scrapping the component.

[c35] The method of claim 34, wherein the component is a mask used for a semiconductor manufacturing process.